

# Art and Chemistry

*The following essay was written especially for this publication by Roald Hoffmann, John A. Newman Professor of Physical Science at Cornell University, who, with Vivian Torrence, created the exhibition **Chemistry Imagined**, presented at the Johnson Museum this past spring.*

There is chemistry in art, from the intense phthalocyanine pigments so important to a modern palette, through the technology of silk screening and lithography. Chemistry and physics shape the tools, but do they affect art in an essential way? I think they do. Witness the new ways of seeing offered up by the art of photography, or the sound spectrum of a synthesizer. Craft and art are intimately related.

There is art in chemistry. The aesthetic principles of science are not that different from those of art. Take the simple and the complex, two elements of an aesthetic. A Greek classical temple is beautiful, and so is an intricately detailed Bavarian rococo church. And a simple molecule,  $C_8H_8$ , shaped as a cube, attracts us, as much as a gigantic, complexly curled-up protein—hemoglobin—a jumble of atoms characterized by no symmetry, but with a marvelous specificity of function. Beauty, elegance, deep understanding are sought by chemists just as much as they are by artists.

There are deeper connections between science and art, waiting to be explored. Both human activities are ways of understanding the universe around us. Art and science share a desire for knowing that which is not yet known. They share so many things: the nature of inquiry, the intellectual process, the formulation of ideas, a concentration on the observable, a deep examination of the nature of perception and the ways perceptions change with the observer. Chemistry and art synthesize by melding old knowledge with new observations to provide us with novel concepts of nature or of the human relationship to nature. As Paul Klee puts it, we set out to make the invisible visible, the unknowable knowable.

My initial conception of **Chemistry Imagined**, the exhibition and Smithsonian Institution Press book that Vivian Torrence and I created, was typically scientific, therefore linear. Already, prior to our collaboration,

Vivian Torrence's collages explored the forces of nature, and the tension between human beings, measurement, and nature. I knew that she would respond to chemistry, which she had not studied previously (though she remembered that miracle of miracles: a substantive and interesting high school chemistry course).

I figured I would just introduce her to chemistry, and she would create a suite of collages that would react to this science of molecules and their transformations. I would then respond to Vivian's images as a writer, in essays and poems, with interesting chemical stories retold for a general audience. In case Vivian wandered too far, my writing would bring the book back to chemistry.

The nature of the creative process has ways of subverting such linear plans. And the work of art—here Vivian's collages and my writing combined—carves out its own space. So it happened in this project. Vivian Torrence and I did talk, we toured a chemical plant and many labs. We rummaged in old book stalls, and Cornell's libraries. There we found, aside from inspiration, some of the graphic sources for the collages. We worked at a remove—Vivian was in Palo Alto or Munich—but during a critical period when the first collages took shape, she was here, thanks to a grant from the Council for the Creative and Performing Arts at Cornell.

We would look together at a partially assembled collage, and my response would affect the way she would proceed. Sometimes I felt urgently that Vivian should create a collage about agricultural chemistry, or molecular mimicry, or dyes. To prompt her I wrote a background paper or a short essay. Sometimes this worked as an inspiration to the artist. Sometimes it didn't.

Sometimes when Vivian did her collage I changed my essay, responding to some new element in the art. A couple of times I had an essay in place, and a new collage came up, and I knew, just knew, that the old essay fit the new collage, and so I shifted it. When it was done in 1991, we laid out the text-collage pairs on the floor and looked for affinities, natural bonds as strong as chemical ones. In the end **Chemistry Imagined** itself was a collage.

Let me address some of the formal issues that came up in this work, for I think they reflect on both the tension of art and science, and on the problems of combining art forms.

*Text and Image.* When we have text and image together there is a tendency to subordinate one to the other. The reigning contexts are those of illustration and explication. If we approach the text as primary, we expect the images accompanying such a text to illustrate. And if the image is primary—think of an exhibition catalogue—we expect the text to explain, to compare, to unearth the origins of the image. It's difficult to have text and image play complementary roles. We struggled to achieve that balance in **Chemistry Imagined**.

*Mystery and Clarity.* I, as writer, felt constraints and a certain tension between my texts and Vivian's images. Her images are positioned somewhere in the broad range of surrealist creation—even if the elements are representational, they are mysterious. The mind of the reader/viewer enjoys that mystery; properly engaged, it seeks to understand it. And it looks to a label, a title, especially a text, for help.

If Vivian was appropriately mysterious, my essays had to be clear. It's what one expects of popular science. At times I felt that I could not put a poem next to a collage that was not explicit. For some reason beyond comprehension, people who are used to immense complexity in their lives insist on believing that poems are *difficult!*

*Juxtaposition.* At the heart of this collaboration, and collage-like, is the placement of text vs. image, of A vs. B, chemistry as seen by artist, by writer, by chemist. So it should not be a surprise that oppositions or balances should emerge within my text. Thus it seemed natural to juxtapose Mendeleev's draft of the periodic table with Blake's draft of "The Tyger," or to mix in my essay accompanying Vivian's "Simply Burning" a factual description of the nuclear burning that gives rise to the elements with a poem, in which the story of Genesis is respectfully rewritten.

There is a historical precedent for **Chemistry Imagined**, though it happens to be over four hundred years old. In 1531 Andrea Alciati published in Italy, in Latin, his "Emblemata Flumen Abundans." This was followed by hundreds of similar so-called *emblem books*. These books were essentially collections of symbolic pictures and explications. Their appearance was "emblematic"—on a page there was a mysterious drawing, woodcut, or etching, above it a title or motto, below it an often equally mysterious explanation or commentary on the visual representation. The verbal response was most often in verse.

The subject matter of these emblem books was sometimes mystical, often sensual, at times religious. In these remarkable symbols of the Renaissance there are connections and allusions to medieval bestiaries, opera and the masque, cartography, and picture dictionaries. Vivian Torrence and I have produced a modern emblem book, exploring the soul of chemistry through art. Cornell was exactly the right place to do it.

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